

EXHIBIT : 5

REDACTED

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**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS**

State of Texas, *et al.*,

Plaintiffs,

v.

Google LLC,

Defendant.

**Case No. 4:20-CV-957-SDJ
Hon. Sean D. Jordan**

Expert Report of Professor Steven N. Wiggins

July 30, 2024

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transactions . . . involving U.S. users.”²⁶⁸ However, while the data he uses do allow for the isolation of transactions involving U.S. users, Mr. Andrien’s counts are not limited to transactions involving U.S. users. Instead, he uses counts of worldwide transactions.²⁶⁹

121. Correcting this error reduces Mr. Andrien’s de-duplicated transaction count from [REDACTED] [REDACTED].²⁷⁰

B. Mr. Andrien Incorrectly Includes In-App Transactions

122. As noted above, Mr. Andrien explains that “[i]n order to count violations, I use data as provided by Google on ‘web display transactions . . . involving U.S. users.’”²⁷¹
123. My review of Mr. Andrien’s programming code reveals that, while the data he uses do allow for the exclusion of in-app transactions, he does not in fact exclude in-app transactions.²⁷² As a result, despite his stated method of counting only alleged violations for Open Auction web transactions, Mr. Andrien includes in-app transactions as well.
124. Excluding in-app transactions further reduces Mr. Andrien’s de-duplicated transaction count to [REDACTED] [REDACTED].²⁷³

²⁶⁸ Andrien Report at ¶ 97.

²⁶⁹ Mr. Andrien creates the data for his calculations in programs [REDACTED]

[REDACTED] As a result, Mr. Andrien’s analysis includes both transactions involving U.S. users and transactions involving users in other countries.

²⁷⁰ [REDACTED]

²⁷¹ Andrien Report at ¶ 97; see also *id.* at ¶ 55 (“The Plaintiff States allege that Google engaged in unfair, false, deceptive, and misleading business practices related to their display advertising technology and changes it made to the auctions for web display ads during the period of at least 2013 to the present.”).

²⁷² Mr. Andrien creates the data for his calculations in programs [REDACTED]

[REDACTED] As a result, Mr. Andrien’s analysis includes both web transactions and in-app transactions.

²⁷³ [REDACTED]

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C. Mr. Andrien Incorrectly Includes States that Cannot Recover Civil Penalties for Business-to-Business Transactions

125. Plaintiffs' claims and Mr. Andrien's data and analysis concern only business-to-business transactions between Google and its advertiser or publisher customers.²⁷⁴ I understand that the deceptive trade practices acts of Arkansas, Idaho, Indiana, and Utah apply only to consumer transactions.²⁷⁵ It follows that Mr. Andrien's transaction counts should not include transactions associated with those four states. Excluding those four states further reduces Mr. Andrien's de-duplicated transaction count to [REDACTED]

[REDACTED]²⁷⁶

D. Mr. Andrien Incorrectly Allocates Transaction Counts to Plaintiff States by Failing to Use Available Data About Advertiser Locations

126. Mr. Andrien allocates his overall transaction counts to the 17 plaintiff States on the basis of internet-subscriber data drawn from the U.S. Census Bureau's American Community Survey. He begins by estimating the number of internet subscribers in all of the plaintiff States.²⁷⁷ He next divides the number of internet subscribers in those states by the total number of internet subscribers in the U.S. as a whole and then multiplies that ratio (about 29 percent on average between 2013 and 2023) by his count of U.S. transactions to estimate a count of transactions associated with all of the plaintiff States.²⁷⁸
127. Mr. Andrien apparently recognizes that a more accurate allocation method would use the

²⁷⁴ See, e.g., Andrien Report at ¶ 29 ("I understand that, starting at least as early as 2010 and running through September 2019, Google represented to both *publishers and advertisers* that AdX was operated as a second-price auction.... Further, I understand that Google made misrepresentations and concealed important information related to this conduct, even concealing some of these programs entirely, thus misleading and deceiving *auction participants* and causing them to behave differently than they would have but for Google's misconduct." (emphasis added)). See also FAC at ¶ 526 ("Google failed to properly disclose these programs (or disclose them at all) and misled publishers and advertisers about their existence and effects.").

²⁷⁵ See Google LLC's Motion to Dismiss Pursuant to Rule 12(b)(6) at 25-26, *State of Texas, et al. v. Google LLC*, No. 4:20-cv-00957-SDJ (E.D. Tex. Feb. 8, 2024), ECF No. 224 ("Plaintiffs' allegations relate to transactions with publishers and advertisers, and not to consumer transactions. Arkansas, Idaho, Indiana, and Utah therefore fail to state claims under their DTPAs, and those claims should be dismissed.").

²⁷⁶ [REDACTED]

²⁷⁷ Andrien Report at ¶ 94.

²⁷⁸ Andrien Report at ¶ 94.

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locations of advertisers and publishers (rather than internet subscriber statistics),²⁷⁹ but he fails to use the data on the billing state of advertisers and publishers that Google has produced.²⁸⁰

128. I use these data to estimate each U.S state's percentage of U.S. impressions,²⁸¹ based on the billing address of advertisers and publishers.²⁸² [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]²⁸⁴

E. Mr. Andrien Incorrectly Assumes that the Alleged Deception Persisted Longer Than It Did

129. Mr. Andrien's counts assume that transactions were affected by the alleged deception until May 2024.²⁸⁵ But the conduct on which plaintiffs' deception claims are based was disclosed before May 2024, and under their theory, the alleged deception could not have

²⁷⁹ Mr. Andrien states, "Based on Google's verified discovery responses, Google has not identified the state of residence, organization or incorporation of any of its customers and has not otherwise produced, among other relevant requested data, revenue and profit specific to the plaintiff States in this matter. Based on the information currently available at this time, I have estimated the share of Google's display advertising revenue and profit associated with the plaintiff States using the below described methodology." Andrien Report at ¶ 91.

²⁸⁰ Although Mr. Andrien relies on Google's April 8, 2024 interrogatory responses, Google supplemented those responses on May 3, 2024 to explain that "Google has identified ordinary-course sources of current information on customer billing state ... which can be mapped to customer identifiers in the above-mentioned datasets, and has generated 'crosswalks' between these datasets and billing state sources." See Defendant Google LLC's Supplemental Response to Plaintiffs' Second Set of Interrogatories, May 3, 2024, at 4; see also GOOG-AT-EDTX-DATA-001116100; GOOG-AT-EDTX-DATA-001116099.

²⁸¹ Similar, but slightly smaller, state allocation shares result if I use gross revenue instead than impressions. Calculations included in workpaper "Allocation_Shares.xlsx."

²⁸² Some advertisers and publishers are assigned to multiple billing states. In these situations, I use Mr. Andrien's state internet subscriber estimates to allocate the relevant impressions to individual states. For example, the data may indicate that an advertiser's billing states are New York, Texas, and Florida. I assign a share of the advertisers' impressions to each state equal to the percentage of internet subscribers in that state (calculated as the number of internet subscribers in that state divided by the total number of internet subscribers in all billing states associated with the advertiser).

²⁸³ [REDACTED]

[REDACTED]

[REDACTED]

²⁸⁵ See Andrien Report at ¶ 99 and Table 2.

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affected transactions after the underlying conduct was disclosed.

a. Reserve Price Optimization

130. To estimate the number of transactions affected by the alleged deception about RPO, Mr. Andrien counts transactions occurring between the months when RPO launched (April 2015) and when Google introduced the unified first price auction (September 2019).²⁸⁶ Mr. Andrien disregards that the alleged deception about RPO ended in May 2016, when Google publicly disclosed that it had introduced a program that “uses historical data to automate the post-auction analysis and updating of floor prices that publishers already do, and takes it a step further.”²⁸⁷ Implementing this correction—and counting only transactions from April 2015 to May 2016 as potentially impacted by the alleged deception about RPO—reduces the number of relevant transactions associated with the alleged RPO-related deception [REDACTED]

[REDACTED].²⁸⁸

b. DRS v1

131. Mr. Andrien and I assume that only transactions from August 2015 to November 2016²⁸⁹

²⁸⁶ See Andrien Report, at ¶ 127 and Table 4 (indicating that the RPO penalty period started on 3/31/2015 and ended on 9/25/2019 and explaining that when “[the beginning of the penalty period] is after the first day of the month, violation count starts on the first day of the following month; if [the end of the penalty period] is after the first day of the month, violation count ends on the last day of the previous month”); see also Defendant Google LLC’s First Amended Responses and Objections to Plaintiffs’ Third Set of Interrogatories, Responses to Interrogatory No. 6 at 12 (reporting that “Reserve Price Optimization launched on or about March 31, 2015. RPO v.2 subsequently launched on or about October 5, 2015. Prior versions of RPO were disabled along with the Google Ad Manager switch to first-price auctions in September-October 2019. In June 2022, Google launched a version of RPO designed for Ad Manager’s first-price auction, known as Optimized Pricing, on select web traffic, and it was extended to all web traffic in January 2023.”).

²⁸⁷ See Bellack, Jonathan, “Smarter optimizations to support a healthier programmatic market,” *Google Ad Manager Blog*, May 12, 2016, available at <https://blog.google/products/admanager/smarter-optimizations-to-support/> (last accessed July 26, 2024); GOOG-AT-MDL-C-000015606 at -611.

²⁸⁸ [REDACTED]

²⁸⁹ This range is conservative because Google disclosed DRS v1 on August 4, 2015, prior to the full launch of DRS v1 on August 20, 2015. See GOOG-AT-MDL-C-000035251 at -251 (Google Help Center post with filename of “web_152039_version_47_2015-08-04__11_33_52.pdf”, explaining that “[t]he Ad Exchange auction closing price is determined as the greater of the second-highest net bid in the Ad Exchange auction or the reserve price applied to that impression. *In some cases, the auction may close at a price lower than the reserve price applied, due to auction optimizations.* Sellers are paid the Ad Exchange closing price, *net of Google’s revenue share*, but will receive, subject to the terms governing their use of Ad Exchange, no less than the min CPM applied to the auction.” (emphases

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would potentially be affected by the alleged deception about DRS v1.²⁹⁰

c. DRS v2

132. To estimate the number of transactions affected by the alleged deception about DRS v2, Mr. Andrien counts transactions occurring between the months when DRS v2 launched (December 2016) and when it was replaced by truthful DRS (July 2018).²⁹¹ Mr. Andrien disregards that, in June 2016 (i.e., roughly six months before it introduced DRS v2), Google publicly disclosed that it “may increase or decrease revenue share per query. If you’d prefer to apply your contracted revenue share on every query, use the new Ad Exchange UI Admin control to exclude all the sites you monetize through your account from revenue share-based optimizations.”²⁹² As a result, there was no period of time during which transactions were impacted by any alleged deception related to DRS v2.²⁹³

added)); Defendant Google LLC’s First Amended Responses and Objections to Plaintiffs’ Third Set of Interrogatories, Responses to Interrogatory No. 6 (“Dynamic Revenue Share launched on or about August 20, 2015.”).

²⁹⁰ Bidders were likely to detect DRS v1 even if it had not been disclosed. In particular, with DRS v1, a bidder submitting a bid in the “dynamic region” (i.e., between the publisher set price floor and the amount that an advertiser would need to bid to clear that price floor, after accounting for AdX’s revenue share) would sometimes win an impression that, in absence of DRS v1, it could not win and it would pay its bid for such an impression. Therefore, detecting DRS does not require a high level of sophistication or monitoring: a bidder could simply observe that it was winning impressions that it should not have been able to win.

²⁹¹ See Andrien Report Exhibit 5 (indicating that DRS v2 started on 12/1/2016 and ended on 7/17/2018 and explaining that when “[the beginning of the penalty period] is after the first day of the month, violation count starts on the first day of the following month; if [the end of the penalty period] is after the first day of the month, violation count ends on the last day of the previous month”); see also Defendant Google LLC’s First Amended Responses and Objections to Plaintiffs’ Third Set of Interrogatories, Responses to Interrogatory No. 6, at 12 (indicating that “Dynamic Revenue Share launched on or about August 20, 2015. DRS v. 2 subsequently launched on or about December 1, 2016. tDRS subsequently launched on or about July 17, 2018.”).

²⁹² See “2016 releases archive: DoubleClick for Publishers and Ad Exchange Seller,” *Google Ad Manager Help*, available at <https://support.google.com/admanager/answer/7421657?sjid=10086602547051235141-NA#zippy=%2Cjune-change-history-update-safe-frame-for-creative-types-deal-check-bid-filter-apply-per-query-revenue-share-optimization> (last accessed July 25, 2024) (providing a Q2 2016 Ad Exchange release stating “New Ad Exchange control for applying per-query revenue share optimization”); GOOG-AT-MDL-C-000015769 at -779. See also Weinberg Report at ¶¶ 197 (explaining that “Google announced DRSv2 when it was launched,” but arguing that “if the concept of debt was not clearly disclosed, the general description of DRS as per-query revenue share optimization is insufficient for advertisers to draw conclusions at the level I have drawn in my report.”); Andrien Report at ¶ 39 (“Google announced DRSv2 (under a different name) when it was launched and allowed publishers to opt out of the program (if a publisher opted out, DRSv1 was turned off as well), but advertisers and ad buying tools could not.”).

²⁹³ See Table C1 in Appendix C.

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d. Project Bernanke

133. Mr. Andrien and I assume that only transactions occurring between the months when Bernanke launched (November 2013) and when Alchemist replaced second-price Bernanke (October 2019) would potentially be affected by the alleged deception about the versions of Bernanke that were designed for second-price auctions.²⁹⁴

e. Alchemist

134. To estimate the number of transactions affected by the alleged deception about Alchemist (also known as first-price Bernanke), Mr. Andrien counts transactions occurring between the first full month when Google ran a unified first price auction (October 2019) and May 2024.²⁹⁵ In doing so, Mr. Andrien disregards that the complaint in this litigation was largely unsealed in October 2021, and the unsealed complaint publicly revealed, that “Bernanke effectively manipulates” an advertiser’s bid “without [the advertiser’s] knowledge (or anyone’s knowledge) before routing it to Google’s exchange.”²⁹⁶ Recognizing that disclosure and counting only transactions from October 2019 through

²⁹⁴ See Andrien Report Exhibit 5 (indicating that “Second-Price Bernanke” started on 11/11/2013 and ended on 10/25/2019 and explaining that when “[the beginning of the penalty period] is after the first day of the month, violation count starts on the first day of the following month; if [the end of the penalty period] is after the first day of the month, violation count ends on the last day of the previous month”); see also Defendant Google LLC’s First Amended Responses and Objections to Plaintiffs’ Third Set of Interrogatories, Responses to Interrogatory No. 6 at 12 (“Project Bernanke launched on or about November 11, 2013. Subsequent versions of Bernanke include Global Bernanke, which launched on or about August 12, 2015; Project Bell v.2, which launched on or about October 26, 2016; and a further version of Bernanke compatible with Ad Manager’s first-price auction (sometimes known as ‘Alchemist’), which launched no later than on or about October 25, 2019.”).

²⁹⁵ See Andrien Report Exhibit 5 (indicating that “First-Price Bernanke” started on 10/25/2019 and continued to the “present” and explaining that when “[the beginning of the penalty period] is after the first day of the month, violation count starts on the first day of the following month; if [the end of the penalty period] is after the first day of the month, violation count ends on the last day of the previous month”); *id.* Exhibit 3 (“Auction counts are extended through the end of May 2024 assuming that the count of auctions in each month for the period April 2023 to May 2024 is equal to the average count of auctions during the first three months of 2023.”); see also Defendant Google LLC’s First Amended Responses and Objections to Plaintiffs’ Third Set of Interrogatories, Responses to Interrogatory No. 6 at 12 (reporting a “further version of Bernanke compatible with Ad Manager’s first-price auction (sometimes known as ‘Alchemist’), which launched no later than on or about October 25, 2019”).

²⁹⁶ See Second Amended Complaint ¶¶ 151-153, *State of Texas, et al. v. Google LLC*, No. 1:21-md-03010-PKC (S.D.N.Y. Oct. 22, 2021), ECF No. 152. Bernanke was also discussed in a *The Wall Street Journal* article from April 2021 (Horwitz, Jeff and Keach Hagey, “Google’s Secret ‘Project Bernanke’ Revealed in Texas Antitrust Case,” *The Wall Street Journal*, April 11, 2021, available at <https://www.wsj.com/articles/googles-secret-project-bernanke-revealed-in-texas-antitrust-case-11618097760> (last accessed July 25, 2024)) and in an *Ad Exchanger* article from January 2022 (Schiff, Allison, “More Details Revealed On Project Bernanke And Jedi Blue In Newly Unsealed Google Suit,” *AdExchanger*, January 14, 2022, available at <https://www.adexchanger.com/online-advertising/more-details-revealed-on-project-bernanke-and-jedi-blue-in-newly-unsealed-google-suit/> (last accessed July 25, 2024)).

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October 2021 as potentially impacted by the alleged deception about Alchemist reduces the number of potentially affected transactions [REDACTED]

[REDACTED]²⁹⁷

f. Equal Footing

135. To estimate the number of transactions affected by the alleged “Equal Footing” deception, Mr. Andrien counts transactions occurring between the month when Google announced that all bidders in the unified first price auction would be treated equally (November 2019) and May 2024.²⁹⁸ In doing so, Mr. Andrien disregards that Alchemist and the Facebook Network Bidding Agreement (NBA) were publicly disclosed when the complaint for this litigation was largely unsealed in October 2021 and that industry participants were therefore on notice of both forms of Bernanke and the Facebook NBA as of that point in time.²⁹⁹ Recognizing that disclosure and counting only transactions from October 2019 through October 2021 as potentially impacted by the alleged deception about Alchemist and the NBA reduces the number of potentially affected transactions [REDACTED]

²⁹⁷ [REDACTED]

²⁹⁸ See Andrien Report at ¶ 99 (“For Equal Footing/AdX Fairness, I use November 20, 2019 as the starting date, which is the date of the earliest identified widespread representation by Google regarding auction participants competing equally, though as stated above, Google made such representations before that time.”); *id.* Exhibit 4 (assuming that the equal footing violation is ongoing, listing “Period End” as “Present”); *id.* Exhibit 3 (“Auction counts are extended through the end of May 2024 assuming that the count of auctions in each month for the period April 2023 to May 2024 is equal to the average count of auctions during the first three months of 2023.”).

²⁹⁹ See Second Amended Complaint ¶¶ 151-153, 203-234, *In re Google Digital Advertising Litig.*, No. 1:21-md-03010-PKC (S.D.N.Y. Oct. 22, 2021), ECF No. 152. The NBA was also discussed in a *The Wall Street Journal* article from April 2021 (Horwitz, Jeff, and Keach Hagey, “Google’s Secret ‘Project Bernanke’ Revealed in Texas Antitrust Case,” *The Wall Street Journal*, April 11, 2021, available at <https://www.wsj.com/articles/googles-secret-project-bernanke-revealed-in-texas-antitrust-case-11618097760> (last accessed July 25, 2024)), and in an *Ad Exchanger* article from October 2021 reporting that “[t]he unsealed suit also contains more detail on Jedi Blue, the codename for Google’s alleged agreement to charge Facebook lower fees and give Facebook information, speed and other advantages in header bidding auctions in exchange for Facebook’s support of Open Bidding, Google’s header bidding alternative.” Schiff, Allison, “Dominance And Collusion: Inside The Unredacted Antitrust Lawsuit Against Google’s Ad Tech Business,” *AdExchanger*, October 25, 2021, available at <https://www.adexchanger.com/platforms/dominance-and-collusion-inside-the-unredacted-antitrust-lawsuit-against-googles-ad-tech-business/> (last accessed July 25, 2024); see also Lyden, Carolyn, “Google allegedly creates ad monopoly with Facebook to favor its own exchange according to new, unredacted details from Project Jedi,” *Search Engine Land*, October 25, 2021 available at <https://searchengineland.com/google-allegedly-creates-ad-monopoly-with-facebook-to-favor-its-own-exchange-according-to-new-unredacted-details-from-project-jedi-375487> (last accessed July 25, 2024).

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- [REDACTED] .³⁰⁰
136. Accounting for all of the disclosures discussed above further reduces Mr. Andrien’s de-duplicated count of transactions [REDACTED]

[REDACTED] .³⁰¹

F. Mr. Andrien Does Not Account for Statutes of Limitations

137. I understand that many of the plaintiff States’ respective statutes of limitations define intervals of time following disclosures during which DTPA violations can be alleged and penalties claimed. Mr. Andrien’s transaction counts do not take account of these statutes of limitations.
138. Counsel for Google has provided me information on each plaintiff State’s “critical date,” which is the date corresponding to the number of years prior to the filing date of plaintiff States’ original complaint (December 16, 2020) that is equal to the length of that state’s statute of limitations for DTPA claims. If a program was disclosed before the critical date applicable to a plaintiff State, I conclude that the state cannot recover DTPA civil penalties for the alleged deception about that program (i.e., for the purpose of calculating DTPA civil penalties for that state, the number of transactions affected by that alleged deception is zero). Appendix E provides more details about how I account for statutes of limitations in my analysis.
139. Google disclosed RPO in May 2016³⁰² and DRS in June 2016.³⁰³ I understand that Florida, Idaho, Nevada, Puerto Rico, and South Dakota cannot recover DTPA civil penalties if a program was disclosed before December 16, 2016; that Missouri and South Carolina cannot recover DTPA civil penalties if a program was disclosed before December 16,

³⁰⁰ [REDACTED]

³⁰¹ [REDACTED]

³⁰² See Bellack, Jonathan, “Smarter optimizations to support a healthier programmatic market,” *Google Ad Manager Blog*, May 12, 2016, available at <https://blog.google/products/admanager/smarter-optimizations-to-support/> (last accessed, July 26, 2024); GOOG-AT-MDL-C-000015606 at -611-612.

³⁰³ See “2016 releases archive: DoubleClick for Publishers and Ad Exchange Seller,” *Google Ad Manager Help*, June 13, 2016, available at <https://support.google.com/admanager/answer/7421657?sjid=10086602547051235141-NA#zippy=%2Cjune-change-history-update-safe-frame-for-creative-types-deal-check-bid-filter-apply-per-query-revenue-share-optimization>. (last accessed July 25, 2024) (under the Q2 2016 Ad Exchange release stating “New Ad Exchange control for applying per-query revenue share optimization”); GOOG-AT-MDL-C-000015769.

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2017; and that Indiana, Kentucky, Montana, and North Dakota cannot recover DTPA civil penalties if a program was disclosed before December 16, 2018.³⁰⁴ Because RPO and DRS were disclosed before all of these critical dates, I understand that the plaintiff States of Florida, Idaho, Indiana, Kentucky, Missouri, Montana, Nevada, North Dakota, Puerto Rico, South Carolina, and South Dakota cannot recover DTPA civil penalties for alleged deception concerning RPO and DRS. For this reason, applying these states' statutes of limitations would reduce the number of transactions potentially impacted by the alleged deception [REDACTED]

[REDACTED]³⁰⁵

140. Because the alleged deception concerning Bernanke/Alchemist has the earliest start date (November 2013) and ended in October 2021 (i.e., before the statute of limitations expired for any plaintiff State), state statutes of limitations do not change my corrected version of Mr. Andrien's de-duplicated count of potentially impacted transactions by the alleged deception. I note, however, that if Google is not found liable for DTPA violations related to Bernanke/Alchemist, then the statutes of limitations would lead to a reduction in the de-duplicated number of transactions across the other allegedly deceptive programs.

G. Mr. Andrien Incorrectly Includes Unaffected Transactions

141. Mr. Andrien, at the apparent request of plaintiffs' counsel, assumes that all Open Auction transactions occurring during the penalty period for a program were "affected" by the alleged deception about that program.³⁰⁶ Mr. Andrien makes no attempt to link these allegedly "affected" transactions to any gains to Google from the alleged deception.
142. Mr. Andrien includes in his transaction counts some transactions that *could not have been affected by the alleged deception*, even according to the theory laid out by Professor Weinberg, on whom Mr. Andrien relies. In this section, I estimate how many transactions

³⁰⁴ See Appendix E.

³⁰⁵ [REDACTED]

³⁰⁶ Andrien Report at ¶ 98 ("I have assumed that Google's misconduct indirectly affected all Open Auctions within the assumed period associated with each misconduct."); *id.* at ¶ 98, footnote 267 ("I have been asked to assume based on Professor Weinberg's report that all auctions during the period in which RPO, DRSv1, DRSv2, and Bernanke misconducts were active were affected by the claimed misconduct, whether they were directly targeted by the misconduct or not.").

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should have been excluded from Mr. Andrien's transaction counts because, under the plaintiffs' theory, the alleged deception could not have affected (i) the clearing price, (ii) the winning bidder, (iii) whether the transaction cleared on AdX, or (iv) AdX's revenue share. These exclusions are conservative because neither Mr. Andrien nor Professor Weinberg has provided any data or empirical evidence to identify any transactions that would be affected by the alleged deception or to indicate that the remaining transactions *actually were* affected by the alleged deception.³⁰⁷

143. Excluding transactions that could not have been affected further reduces the total count of transactions [REDACTED]

[REDACTED]³⁰⁸ When taken together with the corrections described in the previous subsections, removing unaffected transactions reduces Mr. Andrien's count of affected transactions [REDACTED]

[REDACTED]³⁰⁹

144. Below, I describe the details of how I estimate the number of transactions affected by the alleged deception about each program.³¹⁰ The starting point for each calculation is the transaction count after making the corrections described in the previous subsections (i.e., the counts in row 6 of Table C1 in Appendix C). That is the number that appears in Table C2 in the first row for each program. Successive rows in Table C2 remove unaffected transactions, and the second column of the table describes the reason for the exclusion. The last row for each program reports the number of affected transactions.

a. Reserve Price Optimization

145. Mr. Andrien asserts that the alleged deception regarding RPO led to an increase in the

³⁰⁷ My exclusion of transactions that could not have been impacted by the alleged deception should not be interpreted as a finding that the remaining transactions were impacted.

³⁰⁸ [REDACTED]

³⁰⁹ [REDACTED]

³¹⁰ See also Table C2 in Appendix C.

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average clearing price in AdX auctions.³¹¹ In doing so, Mr. Andrien relies on Professor Weinberg, who asserts that “if the advertiser were aware of RPO, they would have shaded their bid from the beginning.”³¹² Shading (i.e., lowering) bids could result in lower AdX clearing prices. Professor Weinberg also speculates that “if Google is good at optimizing reserves via RPO, a publisher may wish to lower the reserve it sets on AdX in order to give AdX greater flexibility in optimizing its reserve, which would lead to greater revenues for both AdX and the publisher.”³¹³

146. However, even if one takes the plaintiffs’ theory at face value, Mr. Andrien should have accounted for the fact that RPO did not apply to Google Ads.³¹⁴ Because Google Ads was exempt from RPO, there is no reason to believe—and neither Mr. Andrien nor Professor Weinberg provides any evidence, or even asserts—that advertisers using Google Ads would have bid differently absent the alleged deception. For that reason, there is also no reason to believe that publishers—who during this time could set price floors specific to Google Ads³¹⁵—would have modified price floors for Google Ads if RPO had been disclosed.
147. As a result, I exclude from the number of transactions potentially affected by the alleged deception about RPO (i) all AdX transactions for which a Google Ads bid set the clearing price (regardless of whether Google Ads or another bidder won); and (ii) all AdX transactions that Google Ads won and where a price floor set the clearing price.³¹⁶ These

³¹¹ Andrien Report at ¶ 35 (“Google also impacted advertiser behavior through its second-price auction representation and concealment of RPO. Namely, I understand that Google’s representation that it was running a second-price auction encouraged advertisers to bid their true value for impressions, which over time caused later AdX reserve prices to increase, which, in turn, led to a payoff loss for advertisers by decreasing win rates and increasing the average clearing price in later AdX auctions.”).

³¹² Weinberg Report at ¶ 285.

³¹³ Weinberg Report at ¶ 279.

³¹⁴ See GOOG-DOJ-13212948 at -948 (naming “GDN” the “prime example” of a buyer exempted from RPO); GOOG-DOJ-13199603 at -603 (“We are exempting bidders (adx ‘buyer networks’) who submit a second bid to the AdX auction from [RPO] which will effectively make all of GDN demand exempt from [RPO].”). See also Declaration of [REDACTED] May 2, 2024, GOOG-AT-MDL-C-000017971 (“May 2, 2024 [REDACTED] Declaration”) at ¶ 6 (“RPO did not apply to buyers that submitted two bids into the second-price AdX auction.”).

³¹⁵ GOOG-AT-MDL-000875073 at -083, showing that under “AdX Open Auction Pricing Rule”, publishers could set “per-buyer floor.”

³¹⁶ I estimate the number of such transactions based on a Google document reporting the percentage of revenue and queries won by either Google Ads or AdX Buyers (i.e., DV360 and Authorized Buyers), by determinant of the clearing price: GDN (Google Ads), “Other AdX Buyers”, or floor prices. See Email from [REDACTED] (Google),

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exclusions reduce the number of transactions in which the outcome *could have* been affected by the alleged deception about RPO [REDACTED]

[REDACTED].³¹⁷

Overall, the full set of corrections cumulatively reduces Mr. Andrien's count of transactions potentially impacted by the alleged RPO deception [REDACTED]

[REDACTED].³¹⁸

b. DRS v1

148. As with RPO, Mr. Andrien relies on Professor Weinberg in asserting that auction outcomes would have been different but for the alleged deception regarding DRS v1.³¹⁹ In particular, Professor Weinberg asserts that advertisers would have shaded their bids had Google revealed DRS v1.³²⁰
149. Again, however, even if one were to take this assertion at face value, one needs to account for the fact that DRS v1 did not apply to Google Ads.³²¹ Because Google Ads was exempt from DRS v1, there is no reason to expect—and neither Mr. Andrien nor Professor

“Re: Second pricing mechanism,” December 16, 2013, GOOG-DOJ-15719056 at -056. First, the document reports that, post Bernanke implementation (which is the relevant period for an analysis related to RPO), when Google Ads won, [REDACTED]

[REDACTED] If alternative documents providing the information I use in my calculations become available, I plan to update my calculations accordingly.

³¹⁷ [REDACTED]

³¹⁸ [REDACTED]

³¹⁹ Andrien Report at ¶ 41.

³²⁰ Weinberg Report at ¶ 228 (“By not revealing DRSv1 to the advertisers, Google made material gains. This is because if advertisers were to shade their bids, which is the natural bidding behavior in a non-truthful auction like DRSv1, this would lead to less revenue for both AdX and publishers. However, advertisers likely did not shade their bids, since Google never publicly revealed DRSv1.”).

³²¹ See GOOG-DOJ-15068390 at -391 (“This launch applies to AdX buyers (incl. DBM) on AdX sellers: [] AdWords (GDN): N[o]”).

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Weinberg provides evidence, or even asserts—that advertisers using Google Ads would have shaded their bids absent the alleged deception. Similarly, because Google Ads advertisers would not have changed their bidding strategies, there is no reason to believe publishers would have modified price floors for Google Ads bidders if DRS v1 had been disclosed.

150. As a result, I exclude from the number of transactions potentially affected by the alleged deception about DRS v1 (i) all AdX transactions where a Google Ads bid set the clearing price (regardless of whether Google Ads or another bidder won); and (ii) all transactions that Google Ads won where a price floor set the clearing price.³²² These exclusions reduce the number of potentially affected transactions [REDACTED]

[REDACTED].³²³
Overall, the full set of corrections reduces the number of transactions potentially impacted by the alleged deception about DRS v1 [REDACTED]

[REDACTED].³²⁴

c. DRS v2

151. As explained in Section IV.E(c), Google disclosed DRS v2 before it was launched, so no transactions could have been impacted by any alleged deception related to DRS v2.³²⁵

³²² As discussed above in connection with RPO, I estimate the number of such transactions based on a Google document reporting the percentage of revenue and queries won by either Google Ads or AdX Buyers (i.e., DV360 and Authorized Buyers), by determinant of the clearing price: GDN (Google Ads), “Other AdX Buyers”, or floor prices. See Email from [REDACTED] (Google), “Re: Second pricing mechanism,” December 16, 2013, GOOG-DOJ-15719056 at -056.

³²³ [REDACTED]

³²⁴ [REDACTED]

³²⁵ See “2016 releases archive: DoubleClick for Publishers and Ad Exchange Seller,” *Google Ad Manager Help*, June 13, 2016, available at <https://support.google.com/admanager/answer/7421657?sjid=10086602547051235141-NA#zippy=%2Cjune-change-history-update-safe-frame-for-creative-types-deal-check-bid-filter-apply-per-query-revenue-share-optimization> (last accessed July 25, 2024) (under the Q2 2016 Ad Exchange release stating “New Ad Exchange control for applying per-query revenue share optimization”); GOOG-AT-MDL-C-000015769. See also Weinberg Report at ¶¶ 197 and 131(c) (explaining that “Google announced DRSv2 when it was launched,” but arguing that “if the concept of debt was not clearly disclosed, the general description of DRS as per-query revenue share optimization is insufficient for advertisers to draw conclusions at the level I have drawn in my report.”); Andrien Report at ¶ 39 (“Google announced DRSv2 (under a different name) when it was launched and allowed publishers to opt out of the program (if a publisher opted out, DRSv1 was turned off as well), but advertisers and ad buying tools could not.”).

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This is shown in Table C1 in Appendix C, which reports that the proper count of transactions associated with the alleged deception about DRS v2 is zero.

152. Table C4 in Appendix C reflects the alternative assumption that transactions potentially could have been affected if they occurred between the months when DRS v2 launched (December 2016) and when it ended (July 2018).³²⁶ This period encompasses all transactions that occurred while DRS v2 was in effect and thus reflects the most conservative approach to estimating the period during which transactions potentially were affected by DRS v2.³²⁷ In this analysis, I further assume that the DRS v2 was not disclosed until the complaint was largely unsealed in October 2021³²⁸ (which results in no plaintiff State’s statute of limitations barring recovery for the alleged deception about DRS v2).
153. Under these alternative assumptions, I assess how many transactions could have been impacted by the alleged deception about DRS v2, according to plaintiffs’ theory. Mr. Andrien relies on Professor Weinberg to explain how the nondisclosure of DRS v2 could impact advertisers.³²⁹ Professor Weinberg asserts that, if DRS v2 were fully disclosed, no advertisers would have placed any bids into the so-called “dynamic region” (i.e., the region where DRS v2 lowered AdX’s revenue share).³³⁰ Professor Weinberg’s theory indicates that the *only* transactions that could have been affected by the alleged deception regarding DRS v2 are those where the winning bidder either submitted a bid in the

³²⁶ See Andrien Report, Exhibit 5 (indicating that DRS v2 started on 12/1/2016 and ended on 7/17/2018 and explaining that when “[the beginning of the penalty period] is after the first day of the month, violation count starts on the first day of the following month; if [the end of the penalty period] is after the first day of the month, violation count ends on the last day of the previous month”); see also Defendant Google LLC’s First Amended Responses and Objections to Plaintiffs’ Third Set of Interrogatories, Responses to Interrogatory No. 6 at 12 (“Dynamic Revenue Share launched on or about August 20, 2015. DRS v. 2 subsequently launched on or about December 1, 2016. tDRS subsequently launched on or about July 17, 2018.”).

³²⁷ For example, this analysis accounts for Professor Weinberg’s suggestion that Google’s disclosure of DRS v2 was not sufficiently detailed. See Weinberg Report at ¶ 231(c) (“If the concept of debt was not clearly disclosed, the general description of DRS as per-query revenue share optimization is insufficient for advertisers to draw conclusions at the level I have drawn in my report...In order for advertisers to have sufficient information regarding DRSv2 in order to avoid paying more than their value for an impression, Google would have needed to disclose a somewhat precise description of the debt concept. I do not know whether Google indeed made such a disclosure, nor how it was made, but in my opinion such information is vital to advertisers, even if they were already aware in a general sense that DRSv2 optimizes revenue shares on a per-query basis.”).

³²⁸ Second Amended Complaint ¶ 150, *In re Google Digital Advertising Litig.*, No. 1:21-md-03010-PKC (S.D.N.Y. Oct. 22, 2021), ECF No. 152.

³²⁹ Andrien Report at ¶ 42.

³³⁰ Weinberg Report at ¶ 226.

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“dynamic region” (where DRS v2 would lower AdX’s revenue share) or the AdX revenue share was increased so that AdX could recoup the lower revenue share on other transactions.

154. Because DRS v2 did not apply to Google Ads and DV360,³³¹ [REDACTED]
[REDACTED]
[REDACTED]³³²
155. To identify the fraction of Open Auction transactions won by Authorized Buyers who bid in the dynamic region, I rely on a Google document reporting that [REDACTED]
[REDACTED]
[REDACTED].³³³ In addition, I assume that AdX increased the revenue share on a similar percentage of transactions to maintain its 20 percent average revenue share. [REDACTED]
[REDACTED]
[REDACTED]
156. Table C4 shows that, under the alternative assumption that the penalties period for DRS v2 runs from December 2016 to July 2018, removing unaffected transactions would reduce the count of transactions potentially impacted by the alleged deception [REDACTED]
[REDACTED].³³⁴

d. Project Bernanke

157. Mr. Andrien asserts that publishers likely would have changed their reserve prices, and that advertisers would have shaded their bids, if they had known about Bernanke.³³⁵

³³¹ Google Ads was excluded from DRS v1 and v2, and starting in November 2016, DV360 was also excluded. See Email from [REDACTED] (Google), “Fwd: [Monetization-pm] [drx-pm] LAUNCHED! AdX Dynamic Revenue Share (DRS),” September 11, 2015, GOOG-DOJ-15068390 at -391 (“This launch applies to AdX buyers (incl. DBM) on AdX sellers” but not for AdWords (GDN) buyers); Email from [REDACTED]@google.com, “[Launch 145022] Dynamic Revshare v2 on Ad Exchange for AdX Buyers,” March 10, 2016, GOOG-DOJ-14717283 at -283 (“The scope of this launch is limited to AdX buyers.”); Email from [REDACTED]@google.com, “OVERDUE LAUNCH – Please update: [Launch 169646] Remove DBM from AdX dynamic revshare,” November 9, 2016, GOOG-DOJ-14734878 at -878 (“DBM [now DV360] does not plan to participate dynamic revshare v2.”).

³³² Calculations reported in workpaper “DTPA DRSv2.xlsx”.

³³³ See GOOG-AT-MDL-007375273 at -273 (in which the reference in this document to “RTB buyers” should be interpreted as both Authorized Buyers and DV360).

³³⁴ [REDACTED]
[REDACTED]

³³⁵ Andrien Report at ¶ 46.

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However, Bernanke applied only to Google Ads.³³⁶ As a result, had Bernanke been disclosed, non-Google Ads bidders (i.e., DV360 and Authorized Buyers) would not have had an incentive to shade their bids. There is, therefore, no reason to believe that transactions where the AdX clearing price was set by non-Google Ads bidders would have been impacted by the alleged deception related to Bernanke. Similarly, because non-Google Ads bidders would not have changed their bidding strategies, there is no reason to believe publishers would have set different floors for those bidders if Bernanke had been disclosed.

158. Accounting for these facts, I reduce Mr. Andrien’s count of transactions associated with the alleged Bernanke-related deception by excluding: (i) transactions won by Google Ads where non-Google Ads bidders set the clearing price; and (ii) transactions won by non-Google Ads bidders where the clearing price was set by a non-Google Ads bidder or the price floor.³³⁷
159. In addition, I note that, between May 2016 and September 2019, a “truthful” version of Bernanke applied to Google Ads advertisers who were using autobidding.³³⁸ Because this second version of Bernanke was “truthful,” advertisers using autobidding would have had no incentive to modify their bids if Bernanke had been disclosed. As a result, in addition to the exclusions described above, I also exclude transactions occurring between May

³³⁶ Bernanke was a Google Ads program. See GOOG-DOJ-13469175 (“Project Bernanke involves reducing the second price and increasing the first price of the two bids submitted by GDN to the AdX auction.”).

³³⁷ As in the case of RPO and DRS v1, I estimate the number of such transactions based on a Google document reporting the percentage of revenue and queries won by either Google Ads or AdX Buyers (i.e., DV360 and Authorized Buyers), by determinant of the clearing price: GDN (i.e., Google Ads), “Other AdX Buyers”, or floor prices. See Email from [REDACTED] (Google), “Re: Second pricing mechanism,” December 16, 2013, GOOG-DOJ-15719056 at -056.

³³⁸ GOOG-DOJ-AT-02467209 at -209 (indicating that the “truthful” version of Bernanke would “charge the minimum price needed to win the query. No change for non-CO ads.... We propose that for CO [Conversion Optimizer] advertisers (tCPA, fixed CPA, ROAS) gTrade should charge the minimum price to win the query, which makes the traffic look like regular second price auction”).

160. The net result of these exclusions is to reduce the number of transactions potentially affected by the alleged deception about Bernanke [REDACTED]

[REDACTED]

[REDACTED] . 341

161. When Google transitioned to a unified first price auction in September 2019, Bernanke was updated and renamed “Alchemist.”³⁴² Mr. Andrien counts all transactions from October 2019 to May 2024 as impacted by alleged deception concerning Alchemist.³⁴³

162. However, neither Mr. Andrien nor Professor Weinberg has articulated a theory for how the alleged *deception* regarding Alchemist impacts auction participants. Similarly, neither Mr. Andrien nor Professor Weinberg has articulated a theory for how Alchemist was inconsistent with Google’s so-called “equal footing” representations. In particular, neither Mr. Andrien nor Professor Weinberg has asserted or provided evidence that AdX treats

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341 _____

³⁴³ See Andrien Report Exhibit 5 (indicating that “First-Price Bernanke” started on 10/25/2019 and continued to the “present”).

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bids coming into its auctions differently because of Alchemist. Instead, Alchemist is an optimization feature that Google Ads implements using only its own data (i.e., it did not rely on AdX data) before it submits a bid into the AdX auction.³⁴⁴

163. Moreover, Professor Weinberg recognizes that Alchemist is “truthful,” which means that bidders maximize their surplus by submitting bids equal to their own values.³⁴⁵ As a result, there is no reason to believe Google Ads advertisers would have bid any differently if Alchemist had been publicly disclosed. Nor is there any reason to believe that publishers would set different floors if Alchemist had been disclosed. Because neither Mr. Andrien nor Professor Weinberg has provided any economic theory or empirical evidence to suggest that advertisers or publishers would have behaved differently had Alchemist been disclosed, they have provided no basis for assessing the number of transactions, if any, that could have been affected by the alleged deception regarding Alchemist. Similarly, because neither Mr. Andrien nor Professor Weinberg has provided any economic theory or empirical evidence to suggest that AdX treated incoming bids differently because of Alchemist, they have provided no basis for assessing the number of transactions, if any, that could have been affected by the alleged “equal footing” deception about Alchemist. As a result, in both cases, I conclude that the alleged deception regarding Alchemist impacted zero transactions, rather than [REDACTED]

[REDACTED]”³⁴⁶

³⁴⁴ See GOOG-DOJ-06842351 at -359 (“We respect GDN-AdX firewall: we only utilize GDN data to optimize bidding strategy. Any AdX buyer can do this.”). [REDACTED]

³⁴⁵ Weinberg Report at ¶ 266 (“First-Price Project Bernanke has three components: (a) a bid optimizer for GDN users that makes their participation in AdX’s first-price auction truthful, (b) collusion among GDN bidders, which increases GDN’s payoff at the expense of publishers’ revenue, (c) overbidding, which lowers GDN’s and increases publishers’ revenue.”); *id.* at ¶ 47 (“A sealed bid single-item auction is truthful if each bidder receives the best possible outcome (given the other bidders’ bids) by submitting a bid equal to their own value.”).

³⁴⁶ [REDACTED]

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f. Facebook Network Bidding Agreement

164. In discussing Google’s Network Bidding Agreement (NBA) with Facebook, Mr. Andrien asserts that “Google provided Facebook with advantages that were not available to other auction participants, and because of the confidentiality of the NBA, such advantages were not disclosed to other participants.”³⁴⁷ However, Mr. Andrien does not examine the extent to which these alleged advantages actually impacted transactions.
165. The Open Auction transaction data on which both Mr. Andrien and I rely show that, since November 2019 (the date when Google allegedly stated that all bidders would be on an “equal footing”),³⁴⁸ [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]³⁵¹

H. Mr. Andrien Vastly Overstates the Number of Affected Transactions

166. In my foregoing analysis, I have provided a number of reasons why Mr. Andrien’s count of [REDACTED] greatly exaggerates the number of transactions that could have been affected by the alleged deception. After making all of the corrections described above, the de-duplicated number of transactions that potentially could have been affected by the alleged deception falls to [REDACTED],³⁵² as shown in Figure 1 below.

³⁴⁷ Andrien Report at ¶ 53. The NBA is the “Network Bidding Agreement” between Facebook and Google. See GOOG-TEX-00144513. Jedi Blue is Google’s internal name for the NBA. FAC at ¶ 425.

³⁴⁸ See Andrien Report at ¶ 99 and footnote 274.

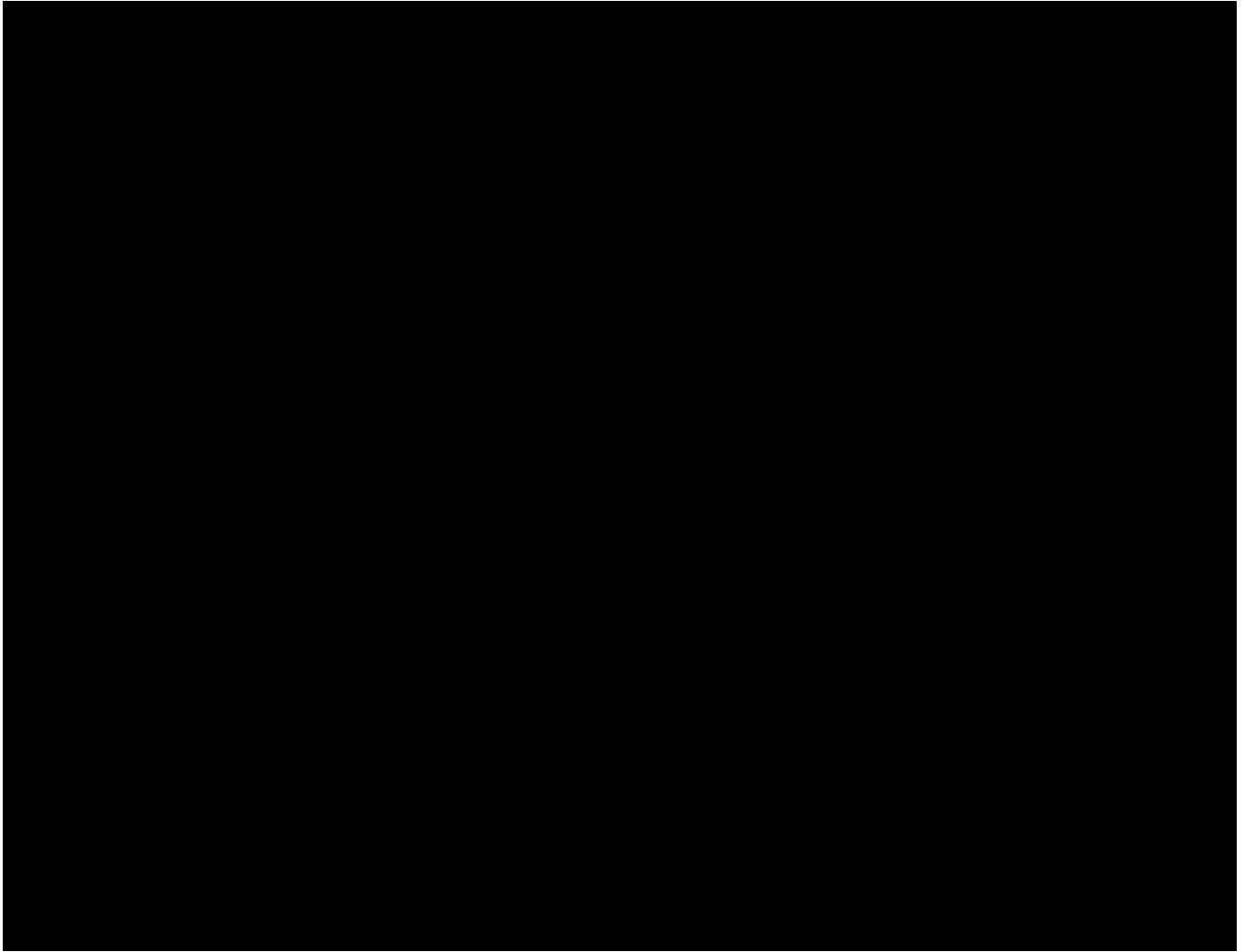
³⁴⁹ Calculation based on the AdX data that Andrien uses in his analysis, limited to Open Auction transactions and excluding app transactions (identified based on the “user device” field).

³⁵⁰ Moreover, in Section VII, I discuss additional reasons why one would expect the impact of the Facebook NBA agreement to be zero.

³⁵¹ See Table C1 in Appendix C.

³⁵² [REDACTED] Table C1 in Appendix C demonstrates that Mr. Andrien’s flawed approach also significantly exaggerates the number of affected transactions if Google is found liable on only a subset of the alleged DTPA claims. See workbook “Deduplicated Counts all Combinations.xlsx” for more details.

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V. Mr. Andrien Has No Basis for His Inflated Per-Violation DTPA Civil Penalties

167. Mr. Andrien asserts that “reasonable and appropriate” per-violation penalties should range from [REDACTED].³⁵³ There is no economic basis for Mr. Andrien’s proposed penalties, which are unrelated to his penalties framework and vastly exceed Google’s profit per transaction.

A. Mr. Andrien Has No Basis for His Proposed Per-Violation Penalties

168. Mr. Andrien does not explain or offer any methodology regarding how he arrived at the per-violation penalty amounts that he proposes. Instead, he simply states that he bases his per-violation penalties on “the information available to me as of today, the analysis

³⁵³ Andrien Report at ¶ 128 [REDACTED]

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alleged deception about RPO would be the same as, or largely similar to, the actual world. In both worlds—with and without the disclosure of RPO—advertisers would have learned how to shade their bids to arrive at the same optimal bidding strategy. Similarly, to the extent that it was optimal for publishers to change their floors given the operation of RPO,³⁸⁰ publishers would have done so regardless of whether RPO was disclosed because, in both the actual and but-for worlds, they would monitor returns and perform experiments to arrive at the optimal price floors.³⁸¹ Moreover, if some advertisers or publishers were uninterested or unskilled at monitoring returns or optimally adapting, there is no evidence to suggest that such parties would respond with greater interest or skill to disclosures about RPO. As a result, the economics implies that Google was unlikely to benefit from the alleged deception about RPO because the underlying behavior of publishers and advertisers was unlikely to be meaningfully different.

191. This conclusion is supported by both ordinary-course-of-business documents³⁸² and an empirical analysis of the available data. For that empirical analysis, I use the fact that, on May 12, 2016, Google announced that AdX was using historical data to set price floors, the objective of which was to increase publishers' revenue.³⁸³

³⁸⁰ Mr. Andrien asserts that “by concealing RPO, Google prevented publishers from effectively optimizing revenue.” Andrien Report at ¶ 34. In doing so, Mr. Andrien relies on Professor Weinberg, who asserts that “via concealing RPO, Google prevented the publishers from effectively optimizing revenue.” Weinberg Report at ¶ 279. However, to my knowledge, none of the plaintiffs’ experts have proposed a theory by which publishers would have changed their floors in a way that would have caused an unambiguous reduction in Google’s profit. As a result, it is ambiguous whether this behavioral response by publishers implies that the deception increased Google’s profit.

³⁸¹ As I discussed in Section II.B, publishers’ decisions about floor prices are inherently the result of a data driven process where floors are adapted to the bidding behavior of advertisers. For example, Google’s RPO feature itself selected publisher-specific revenue maximizing floor prices using *data* on the bids on a publisher’s inventory from the previous day. See GOOG-DOJ-13199480 at -483 (RPO used a “[redacted] pipeline to compute [a] pricing file based on [redacted] data”). At a high level, RPO “involve[d] 3 simple steps”: (i) “Bucket your impressions by features you believe are important to buyers, and record the winning [historical] bids and [historical] transaction prices in each bucket.” (ii) “For each bucket, generate a histogram of historical bids and [historical] transaction prices. Use this histogram to model what the [publisher] revenue would be at a range of possible reserve prices.” (iii) “Pick a reserve price that maximizes predicted revenue [for the publisher], constrained to limit the fraction of bids it eliminates [by setting the reserve price higher] (to preserve match rate).” GOOG-DOJ-07235914 at -915, 916.

³⁸² See, e.g., Email from [redacted] (Google), “Re: Observing optimizations (RPO?) in the wild,” March 18, 2016, GOOG-TEX-00982249 at -249 (“[redacted]”); *id.* at -259 (“Another report of ‘dynamic floors’ being observed.”); see GOOG-DOJ-05311280 at -280 [redacted]).

³⁸³ See Bellack, Jonathan, “Smarter optimizations to support a healthier programmatic market,” *Google Ad Manager Blog*, May 12, 2016, available at <https://blog.google/products/admanager/smarter-optimizations-to-support/> (last

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192. This disclosure provides the opportunity to test directly how the alleged deception regarding RPO affected the clearing prices (i.e., CPMs) of AdX auctions. A finding that CPMs fell abruptly following this May 2016 disclosure, or in the months after, would indicate that Google earned higher profit as a result of the failure to disclose RPO earlier than it would have absent the alleged deception. Such a pattern would also suggest that bidders' strategies adapted to the public disclosure of information about RPO and thus would be consistent with plaintiffs' view of how advertisers behave.³⁸⁴ On the other hand, a finding that CPMs did not fall after the disclosure of RPO would be inconsistent with the plaintiffs' theory and indicate that the alleged concealment of RPO did not generate additional profit for Google via higher clearing prices. This result could occur because advertisers' optimal strategy in response to a fully disclosed RPO would have involved little to no bid shading, because advertisers had already learned how to shade their bids and so had already adapted to RPO prior to the public disclosure, or because announcements about optimization features are simply not a primary focus of advertisers in choosing their strategies.
193. I test for an abrupt decline in clearing prices using an econometric methodology known as "regression discontinuity design" which is commonly used in modern economics, and is in part responsible for what Nobel Laureate and MIT Professor of Economics Joshua Angrist has called the "credibility revolution" in empirical economics.³⁸⁵ The intuition behind the approach is that, so long as other determinants of the outcome vary "smoothly" (i.e., do not change abruptly) across the disclosure "threshold" (i.e., around the date of the disclosure) and are accounted for by properly fitting the underlying trends in the data, then any discontinuity in the outcome that occurs at the time of the announcement is properly

accessed July 26, 2024) ("Optimized pricing in the Open Auction uses historical data to automate the post-auction analysis and updating of floor prices that publishers already do, and takes it a step further."); GOOG-AT-MDL-C-000015606 at -611-612; see also Email from [REDACTED] (Google), "[ANNOUNCED] Smarter optimizations for DoubleClick Ad Exchange," May 12, 2016, GOOG-DOJ-04934481 at -481.

³⁸⁴ Note that, under plaintiffs' theory, the disclosure created, at a minimum, a substantial shift in public information in the market which, even if not understood by all, would have led to significant changes in bidding.

³⁸⁵ See Angrist, Joshua D. and Jörn-Steffen Pischke, "The Credibility Revolution in Empirical Economics: How Better Research Design Is Taking the Con Out of Econometrics," *Journal of Economic Perspectives*, Vol. 24, No. 3, 2010, at 3-30. The increased popularity of this method can be seen in Figure 6.1 of a commonly used graduate-level textbook called *Causal Inference: The Mixtape* by Dr. Scott Cunningham, Yale University Press, 2021, at 241-252, available at https://mixtape.scunning.com/06-regression_discontinuity (last accessed July 25, 2024).

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interpreted as the effect of the disclosure.³⁸⁶ I also test for effects in the months following the announcement.

194. The disclosure of RPO is well-suited for this approach because, to my knowledge, no major optimization features changed in May of 2016 that would cause an abrupt change in auction clearing prices.³⁸⁷ In addition, the disclosure itself was likely unanticipated, and there was no opportunity for the type of strategic behavior by market participants that would invalidate the approach.³⁸⁸ One element of this regression discontinuity approach is shown in Figure 4, which graphically presents the impact of the disclosure of RPO on average CPM in AdX. More specifically, I focus on the natural logarithm of CPM, which means that differences from one month to another can be interpreted as percentage changes.³⁸⁹ Note that, to isolate variation that is potentially due to RPO, I also follow standard practice and adjust the data to remove month-to-month changes attributable to seasonal factors.³⁹⁰

³⁸⁶ This is referred to as the “continuity assumption” of regression discontinuity design. See Cunningham, Scott, *Causal Inference: The Mixtape*, Yale University Press, 2021, at 252-282, available at https://mixtape.scunning.com/06-regression_discontinuity (last accessed July 25, 2024).

³⁸⁷ I note that RPO was launched in April 2015, over one year before the announcement. As a result, RPO implementation itself does not affect CPM around the time of the announcement and my analysis can clearly isolate the effect of the alleged deception.

³⁸⁸ Economists refer to this type of strategic behavior as “manipulation around the threshold.” For example, in this setting, one might ask whether some advertisers could have postponed ad spending from the days before the RPO disclosure to the days after the RPO disclosure. The absence of manipulation around the threshold is a technical condition required for the validity of the empirical exercise. See McCrary, Justin, “Manipulation of the running variable in the regression discontinuity design: A density test,” *Journal of Econometrics*, Vol. 142, No. 2, 2008, pp. 698-714.

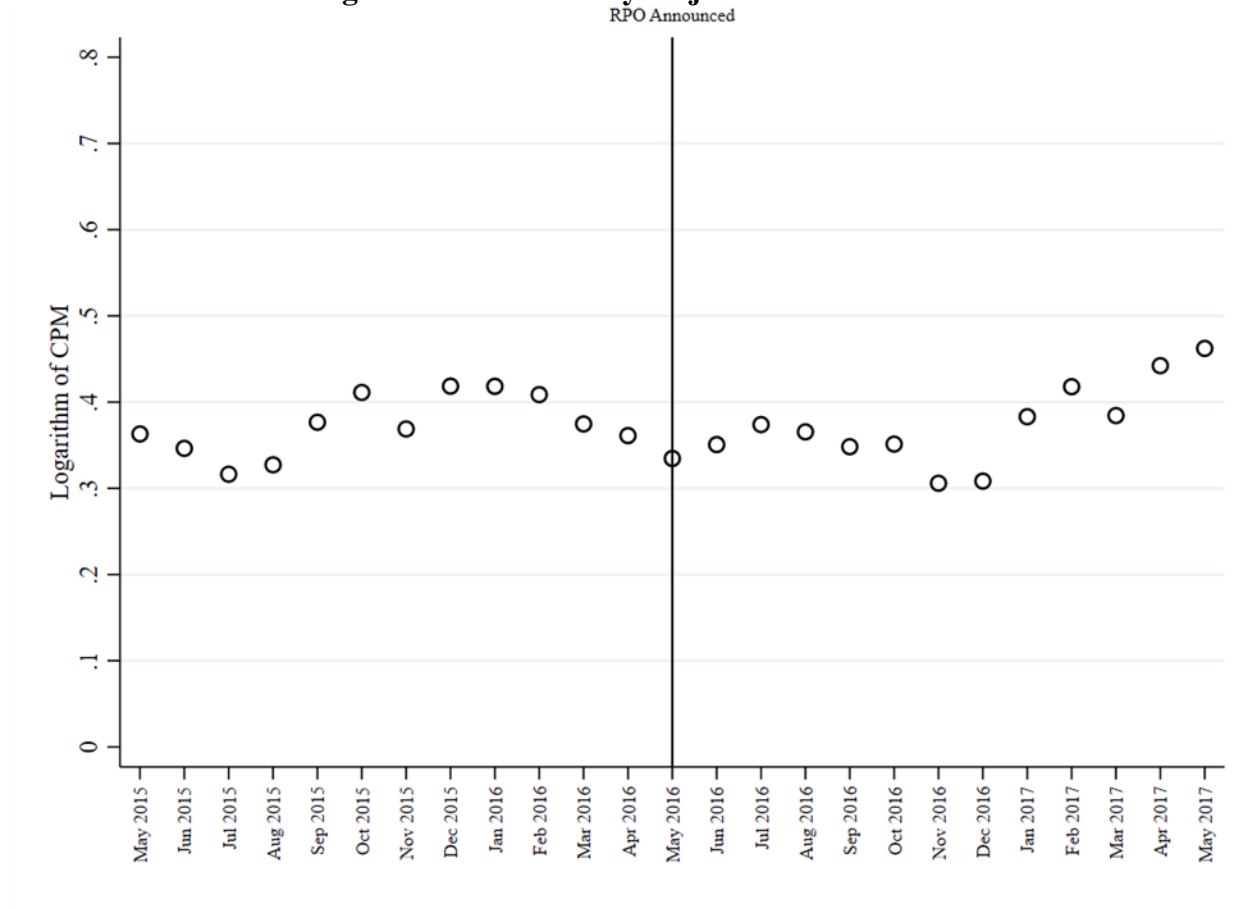
³⁸⁹ For example, a change of 0.1 is interpreted as a 10 percent increase. See Ford, Clay, “Interpreting Log Transformations in a Linear Model,” *University of Virginia Library*, August 17, 2018, available at <https://library.virginia.edu/data/articles/interpreting-log-transformations-in-a-linear-model> (last accessed July 25, 2024).

³⁹⁰ Seasonal adjustment is a standard and accepted technique that is applied by econometricians to remedy issues that otherwise would render statistical inference unreliable. For an intuitive, if simplified, explanation of the need for and uses of seasonal adjustment, see, e.g., Maddala, Gangadhar Rao S., *Econometrics*, McGraw-Hill College, 1977 at 338-342. For a more advanced treatment, see, e.g., Greene, William H., *Econometric Analysis*, Prentice Hall, 7th ed. 2012, at 192-194.

I perform seasonal adjustment using the full sample of data from 2014 through 2019. The intuition of this seasonality adjustment is that, if CPMs are 10 percent higher in December across the full sample, I reduce each December CPM accordingly. Formally, I do this by regressing the log CPM on month fixed effects. The residuals from this regression can be interpreted as changes in CPM that are not explained by seasonality. I then compute the seasonally-adjusted CPM for each month in the sample by adding the residuals from that regression to the average outcome over the 21-month period that includes a window around the disclosure in May of 2016. Adding the average CPM is just a normalization that shifts up the monthly residuals by the same amount in each month but has no effect on the

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Figure 4
Natural Logarithm of Seasonally-Adjusted CPM in AdX Auctions



Notes: [1] Limited to U.S. users. [2] Excludes app and video transactions. [3] CPM is seasonally adjusted.

Sources: AdX Data (see Appendix H for Bates numbers).

195. Figure 4 shows no evidence of a reduction in average CPM in AdX following the disclosure. Rather, average CPM appears to vary smoothly around the time of the disclosure. This result contrasts directly with the plaintiffs’ and their experts’ assertions that the alleged deception caused advertisers to pay higher prices than they would have but-for the alleged deception.³⁹¹ If the plaintiffs and their experts were correct, then

resulting estimates. Results are robust to using alternative numbers of months before and after disclosure (e.g., 12 or 8), as Figure 4 below illustrates.

³⁹¹ See Andrien Report at ¶ 35 (“Namely, I understand that Google’s representation that it was running a second-price auction encouraged advertisers to bid their true value for impressions, which over time caused later AdX reserve prices to increase.”); Weinberg Report at ¶ 285 (“[I]f the advertiser were aware of RPO, they would have shaded their bid from the beginning.”); FAC ¶ 533 (“Google failed to disclose that it would use historical bidding information to artificially drive up the second price, by increasing publisher’s preset price floor and replacing it with an artificially

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publicly revealing RPO should have led advertisers to reduce their bids, which would in turn reduce CPM. I find no evidence of such reductions.

196. In Table 3, I continue this analysis with regression estimates of the discontinuity at the time of the disclosure.³⁹² To assess robustness, I present a variety of alternative specifications: (i) I use different numbers of months of data (24 months of data – *i.e.*, 12 months of data both before and after the disclosure – as well as 20, 16, 12, and 8 months); and (ii) I use linear “fits” of the data (which is the assumed “shape” of how CPM changes over time) for all time windows, as well as quadratic fits for the larger data sets where “overfitting” is less of a concern.³⁹³

Table 3
Estimated Effect of Google’s Disclosure of RPO on CPM

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
# of Months Included	24	24	20	20	16	16	12	8
Assumed Functional Form (Quadratic or Linear)	Quad.	Lin.	Quad.	Lin.	Quad.	Lin.	Lin.	Lin.
Estimated effect of disclosure ^[1]	0.023	-0.087	0.064	-0.069	0.058	-0.020	0.007	0.024
P-value from a two-sided test of statistical significance (t-statistic based) ^[2]	[0.813]	[0.208]	[0.404]	[0.25]	[0.554]	[0.589]	[0.95]	[0.453]

Notes: [1] Estimates are interpreted as the effect of the May 16, 2016 disclosure of the mechanics underlying RPO, and are derived using the natural logarithm of CPM the dependent variable. [2] The test of statistical significance is the two-sided empirical p-value from a permutation test, which measures the fraction of possible t-statistics that are at least as extreme, in absolute value, as the t-statistic from the estimated effect of the actual May 16, 2016 disclosure. It comes from estimating “effects” of placebo policies using time periods of the same length throughout the full sample. To mirror the non-placebo regressions, the placebo disclosure month is excluded from each regression. [3] CPM is seasonally adjusted using data from 2014 to 2019. [4] Data are limited to US users, Open Auctions, web, and non-video transactions. [5] May 2016 is excluded from the sample, since the mechanics of RPO were publicly disclosed midway through that month.

Sources: AdX Data (see Appendix H for Bates numbers)

197. Results from Table 3 indicate that disclosure of RPO was associated with no meaningful changes in average CPM in AdX. In particular, none of the changes are statistically different from zero. Moreover, the point estimates vary from positive to negative, and this variation in sign confirms a lack of systematic evidence of significant change.
198. More specifically, the estimated changes in CPM range between negative 0.087 log points

inflated floor derived from advertiser’s historical bidding information. This resulted in the advertiser paying significantly higher prices than the true second price.”).

³⁹² Results from regression discontinuity analysis is included in workpaper “RD Regression Tables.xlsx.”

³⁹³ See Gelman, Andrew and Guido Imbens, “Why High-Order Polynomials Should Not Be Used in Regression Discontinuity Designs,” *Journal of Business & Economic Statistics*, 2018.

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(-8.3%) in Column 2, and positive 0.064 log points (6.6%) in Column 3.³⁹⁴ While some estimates from approaches that use more data and a linear “fit” result in negative estimates (i.e., Columns (2) and (4)), allowing for either a more flexible quadratic fit (such as in Columns (1) and (3)) or using only data that are closer to the date of the announcement results in estimates that are often positive and frequently close to zero. More importantly, the lack of statistical significance of any of these estimated changes means that, under the standards commonly applied by economists, it cannot be established that any of these changes are statistically different from zero. As a result, the appropriate interpretation of the results in Table 3, as well as the underlying data shown in Figure 4, is that there is no evidence that the disclosure of RPO resulted in advertisers on average paying lower CPMs on AdX transactions and, thus, no evidence that the alleged deception about RPO increased Google’s net revenue or profits by inflating CPM.

199. In order to assess whether the estimates in Table 3 are statistically different from zero, I employ a method called permutation-based inference, also known as randomization inference, which is commonly used in applied economics.³⁹⁵ Specifically, for each column in Table 3, I constructed every possible data series of the same length and assumed that a “placebo” (i.e., not occurring in reality) disclosure occurred in the middle of that series. For example, for Column (1): (i) I constructed every possible 25-month sample from January 2014 through December 2019 (i.e., a sample consisting of 12 months before and 12 months after the month of the placebo event, plus the month of the event);³⁹⁶ (ii) I

³⁹⁴ In this semilogarithmic regression, the percentage change of the dependent variable is given by $100 \times (\exp(\beta) - 1)$, where β is the estimated coefficient of the discrete variable under consideration. See, e.g., Halvorsen, Robert and Raymond Palmquist, “The Interpretation of Dummy Variables in Semilogarithmic Equations,” *American Economic Review*, Vol. 70, 1980, pp. 474-75. Here, the discrete variable at issue takes the value of 1 after the disclosure of RPO and zero otherwise. In column (2) of Table 3, the value of β is -0.087. Hence the percentage change in the natural logarithm of CPM following the RPO disclosure can be calculated using the following equation: $100 \times (\exp(-0.087) - 1) = -8.3\%$. The estimated increase in CPM in column (3) is likewise calculated using a similar equation: $100 \times (\exp(0.064) - 1) = 6.6\%$.

³⁹⁵ See, for example, Cunningham, Scott, *Causal Inference: The Mixtape*, Yale University Press, 2021, available at https://mixtape.scunning.com/10-synthetic_control (last accessed July 25, 2024). This approach to measuring statistical significance accounts for the major form of uncertainty in this context, which is what economists call “design-based uncertainty.” See Rambachan, Ashesh and Jonathan Roth, “Design-Based Uncertainty for Quasi-Experiments,” *Working Paper*, 2020, available at <https://scholar.harvard.edu/sites/scholar.harvard.edu/files/jroth/files/DesignBasedQuasiExperiments.pdf> (last accessed July 25, 2024).

³⁹⁶ When using the 72-month data from January 2014 to December 2019, there are 48 (72 – 12 – 12) “placebo” effects using a 12-month bandwidth (i.e., 12 months of data on each side of the “placebo” threshold).

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defined a placebo disclosure to occur in the 13th month of that sample, just as it did in the actual sample used in Column (1); and (iii) I estimated the effect of the “placebo” event, along with the corresponding t -statistic.³⁹⁷ Below each estimate in Table 3, I report the fraction of t -statistics that are of equal or larger absolute magnitude than the t -statistic corresponding to the estimate for the actual disclosure.³⁹⁸ This is what economists and statisticians often refer to as a two-sided empirical p -value.³⁹⁹ It is the fraction of possible estimates that are at least as extreme as the main estimate of interest. This method of testing for statistical significance avoids false inferences.⁴⁰⁰

³⁹⁷ The t -statistic is the estimated ratio of the coefficient to the standard error for that coefficient. Economists routinely employ t -statistics to test whether the estimated coefficients of regression equations are statistically significant. See, e.g., Verbeek, Marno, *A Guide to Modern Econometrics*, Wiley, 5th ed. 2017, at pp. 20, 23-25.

³⁹⁸ Research finds that randomization inference performs better in some settings when using t -statistics as the test coefficient, rather than coefficients. See MacKinnon, James G. and Matthew D. Webb, “Randomization inference for difference-in-differences with few treated clusters,” *Journal of Econometrics*, Vol. 218, 2020, pp. 435-450, at 435 (“We study two randomization inference (RI) procedures. A procedure based on estimated coefficients may be unreliable when clusters are heterogeneous. A procedure based on t -statistics typically performs better (although by no means perfectly) under the null, but at the cost of some power loss.”); see also Feinstein, Steven and O. Miguel Villanueva, “Securities Litigation Event Studies in the Covid Volatility Regime,” *Journal of Forensic Economics*, Vol. 31, No. 1, 2024, at 8-9 (“In this paper, we propose using the empirical distribution of daily stock return t -statistics during the Covid period to identify the critical values for the statistical significance test. For any stock during the Covid period, one can precisely find from the empirical distribution the 5% frequency t -statistic values and use those values as the critical values to test for return significance. Event returns with t -statistics in the top 2.5% or bottom 2.5% of the observed t -statistics are sufficiently unusual that one can reasonably deem them to be significant, unlikely to have been merely random fluctuations.... We find that the methodology restores correct test size, i.e., eliminates spurious significance, while preserving substantial test power to identify the significant impact on stock prices of earnings announcements in the Covid period.”); Shea, John, “Union Contracts and the Life-Cycle/Permanent-Income Hypothesis,” *American Economic Review*, Vol. 85, No. 1, 1995, at 198. Results are similar when using coefficients as the test statistic, rather than t -statistics. In particular, the empirical p -values corresponding to estimates in Columns (1) – (8) of Table 3 are 0.729, 0.104, 0.423, 0.132, 0.5, 0.571, 0.95, and 0.625, respectively.

³⁹⁹ See, e.g., Knijnenburg, Theo A., Lodewyk F.A. Wessels, Marcel J. T. Reinders, and Ilya Shmulevich, “Fewer permutations, more accurate P -value,” *Bioinformatics*, Vol. 25, No. 12, 2009, at i161 (“Permutation tests have become a standard tool to assess the statistical significance of an event under investigation. The statistical significance, as expressed in a P -value, is calculated as the fraction of permutation values that are at least as extreme as the original statistic, which was derived from non-permuted data.”); see also Brantingham, Jeffrey P., George Mohler, and John MacDonald, “Changes in public-police cooperation following the murder of George Floyd,” *PNAS Nexus*, Vol. 1, No. 5, 2022, pp. 1-11; Carrell, Scott E., Bruce I. Sacerdote and James E. West, “From Natural Variation to Optimal Policy? The Importance of Endogenous Peer Group Formation,” *Econometrica* Vol. 81, No. 3, 2013, pp. 855-882; Bhargava, Saurabh and Ray Fisman, “Contrast Effects in Sequential Decisions: Evidence from Speed Dating,” *Review of Economics and Statistics*, Vol. 96, No. 3, 2014, pp. 444-457; Cattaneo, Matias D. and Rocio Titiunik, “Regression Discontinuity Designs,” *Annual Review of Economics*, Vol. 14, 2022, at 839.

⁴⁰⁰ This fact is demonstrated by examining the frequency with which estimates from the permutations described above are statistically significant when using standard errors from the standard regression. If a method of testing for statistical significance is correct, then approximately 5% of “placebo” estimates should be statistically significant at the 5% level. Instead, I find statistical significance rates are much too high, which indicates that method is incorrect. For example, among estimates from the full set of possible permutations corresponding to the samples and specifications shown in Columns (1) through (8) of Table 3 (i.e., those permutations used in the randomization

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200. Economists usually consider p-values in excess of 5% or 10% as evidence that an estimate is not statistically different from zero (i.e., that the estimated effect is not statistically significant). Because none of the empirical p-values in Table 3 are smaller than 5 or even 10 percent—in fact, the smallest empirical p-value is 20.8 percent (in Column (2))—the estimates are not statistically significant.
201. It is important to note that this statistical insignificance is also consistent with the lack of visually compelling discontinuities in Figure 4 at the time of the announcement and provides further evidence that the disclosure of RPO had no measurable impact on average CPMs in AdX. The results indicate that the world without the alleged deception about RPO would have been materially the same as the world with the alleged deception. For that reason, the evidence indicates that the alleged deception regarding RPO did not generate additional net revenue, or profits, for Google.
202. I also performed two other tests to investigate whether advertisers “learned” to shade their bids in the months that followed the disclosure of RPO. In the first test, I used the same regression discontinuity design described above, except that I excluded the months immediately following the disclosure. In doing so, I allow advertisers to take up to four-and-a-half months following the disclosure to shade their bids, lowering CPMs.⁴⁰¹
203. As shown in Table 4, the results of this analysis do not find evidence that advertisers reduced their bids in the months that followed the announcement of RPO. Only two of the forty estimates are statistically significant at the 10% level, and none are significant at the 5% level.⁴⁰² Combined with the fact that estimates range from negative to positive, this

inference approach I use) I find that 17%, 33%, 23%, 23%, 23%, 20%, 20%, and 8%, respectively, are statistically significant at the 5% level. Similarly, I find that 25%, 44%, 33%, 37%, 34%, 27%, 32%, and 27% are statistically significant at the 10% level. For a well-known example of a study that demonstrated this same problem in a different context, see Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan, “How Much Should We Trust Difference-in-Differences Estimates?,” *Quarterly Journal of Economics*, Vol. 119, No. 1, 2004, at 249 (“Most papers that employ Difference-in-Differences estimation (DD) use many years of data and focus on serially correlated outcomes but ignore that the resulting standard errors are inconsistent. To illustrate the severity of this issue, we randomly generate placebo laws in state-level data on female wages from the Current Population Survey. For each law, we use OLS to compute the DD estimate of its ‘effect’ as well as the standard error of this estimate. These conventional DD standard errors severely understate the standard deviation of the estimators: we find an ‘effect’ significant at the 5 percent level for up to 45 percent of the placebo interventions.”).

⁴⁰¹ The “half” month refers to the fact that the disclosure occurred in mid-May 2016.

⁴⁰² I note that, when computing many estimates, chance alone makes it likely that some of the estimates will be statistically significant. For example, if one were to perform 10 independent statistical tests, one would expect one estimate to be statistically significant at the 10 percent level due to chance. This is what economists and statisticians

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indicates that there is no evidence that advertisers adjusted to the announcement in the subsequent months by reducing their bids. Again, this fact indicates that Google did not earn additional net revenue or profit because of the alleged deception about RPO.

Table 4
Estimated Shift in CPM from Google’s Disclosure of RPO
With Potential Delay in Learning

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
# of Months Included	24	24	20	20	16	16	12	8
Assumed Functional Form (Quadratic or Linear)	Quad.	Lin.	Quad.	Lin.	Quad.	Lin.	Lin.	Lin.
No Delay								
Estimated effect of disclosure	0.02	-0.09	0.06	-0.07	0.06	-0.02	0.01	0.02
P-value from a two-sided test of statistical significance (t-statistic based)	[0.813]	[0.208]	[0.404]	[0.25]	[0.554]	[0.589]	[0.95]	[0.453]
1 Month Delay								
Estimated effect of disclosure	0.03	-0.10	0.11	-0.09	0.15	-0.04	0.03	0.06
P-value from a two-sided test of statistical significance (t-statistic based)	[0.745]	[0.17]	[0.235]	[0.255]	[0.164]	[0.564]	[0.61]	[0.063]
2 Month Delay								
Estimated effect of disclosure	-0.02	-0.11	0.11	-0.12	0.13	-0.06	-0.01	0.09
P-value from a two-sided test of statistical significance (t-statistic based)	[0.783]	[0.152]	[0.22]	[0.14]	[0.389]	[0.481]	[0.828]	[0.129]
3 Month Delay								
Estimated effect of disclosure	-0.09	-0.12	0.07	-0.15	0.12	-0.10	-0.08	0.09
P-value from a two-sided test of statistical significance (t-statistic based)	[0.333]	[0.133]	[0.592]	[0.082]	[0.472]	[0.302]	[0.439]	[0.148]
4 Month Delay								
Estimated effect of disclosure	-0.14	-0.12	-0.02	-0.15	0.07	-0.13	-0.10	-0.01
P-value from a two-sided test of statistical significance (t-statistic based)	[0.295]	[0.227]	[0.813]	[0.146]	[0.731]	[0.173]	[0.357]	[0.967]

Notes: [1] The dependent variable is the natural log of CPM. [2] The test of statistical significance is the two-sided empirical p-value from a permutation test. [3] CPM is seasonally adjusted using data from 2014 to 2019. [4] Data are limited to U.S. users, Open Auctions, and exclude app, video, tv, ctv, game console, and “other” device type transactions. [5] May 2016 is excluded from the sample, since the mechanics of RPO were publicly disclosed midway through that month.

Source: AdX Data (GOOG-AT-MDL-DATA-000066537 - GOOG-AT-MDL-DATA-000481994)

204. For the second test, I examine whether the rate of CPM change over time (rather than the level of CPM) declined following Google’s disclosure of RPO, relative to the months before the disclosure. I do so based on the same linear fit specification I used for the regression discontinuity analysis in Table 3. The test asks whether the estimated “slope,” or rate of monthly change in CPM, changed after Google disclosed RPO in May 2016.

refer to as the problem of multiple inference, or multiple testing. See, e.g., Anderson, Michael L., “Multiple Inference and Gender Differences in the Effects of Early Intervention: A Reevaluation of the Abecedarian, Perry Preschool, and Early Training Projects,” *Journal of the American Statistical Association*, Vol. 103, No. 484, 2008, pp. 1481-95.

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Evidence that this slope decreased following the disclosure would be consistent with the plaintiffs' theory of harm (that the disclosure led to shading). On the other hand, evidence that the slope did not change or increased is inconsistent with plaintiffs' theory and indicates Google did not profit from the alleged deception.

205. Results are shown in Table 5. Estimates are small and range from negative 0.004 to 0.019. None of the estimates are statistically significant. Collectively, these results indicate there is no evidence that advertisers started shading following the disclosure of RPO.^{403,404}

Table 5
Estimated Difference in the Rate of Change of CPM following Google's Disclosure of RPO
An Empirical test of whether learning resulted in a reduction in CPM

Model	(1)	(2)	(3)	(4)	(5)
# of Months included	24	20	16	12	8
Assumed Functional Form	Lin.	Lin.	Lin.	Lin.	Lin.
Estimated difference in time trend after the disclosure of RPO ^[1]	0.003	-0.003	-0.001	-0.004	0.019
P-value from a two-sided test of statistical significance (t-statistic based) ^[2]	[0.833]	[0.827]	[0.964]	[0.817]	[0.188]

Notes: [1] Estimates measure the change in the time trend (i.e., the rate of change or slope) of the natural log of CPM following the May 16, 2016 disclosure of the mechanics underlying RPO. [2] The test of statistical significance is the two-sided empirical p-value from a permutation test, which measures the fraction of possible t-statistics that are at least as extreme, in absolute value, as the t-statistic from the estimated effect of the actual May 16, 2016 disclosure. It comes from estimating "effects" of placebo policies using time periods of the same length throughout the full sample. To mirror the non-placebo regressions, the middle month is excluded from each regression. [3] Estimates come from the same specification as that used in Table 3. [4] Negative estimates are consistent with learning after the disclosure, as it suggests that bids and CPMs decline more after the disclosure than they did before the disclosure. [5] CPM is seasonally adjusted using data from 2014 to 2019. [6] Data are limited to US users, Open Auctions, and exclude app, video, tv, ctv, game console, and "other" device type transactions. [7] May 2016 is excluded from the sample, since the mechanics of RPO were publicly disclosed midway through that month.

Source: AdX Data (GOOG-AT-MDL-DATA-000066537 - GOOG-AT-MDL-DATA-000481994).

206. In summary, the results above are inconsistent with the assertions made by the plaintiffs, Professor Weinberg, and Mr. Andrien. My results indicate that the disclosure of RPO did

⁴⁰³ The test of statistical significance is based on the same permutation-based approach as in Table 3, which is based on the fraction of possible t-statistics that are more extreme than the t-statistic of the actual estimate. The resulting empirical p-values are similar if the test is instead based on coefficients rather than t-statistics. The corresponding p-values for Columns (1) – (5) of Table 5 are 0.792, 0.788, 0.964, 0.8, and 0.484, respectively.

⁴⁰⁴ The largest negative estimate—that is, the estimate that is most consistent with hypothesis that advertisers did not learn to shade until the months after the disclosure—is -0.004. Taken at face value, that estimate, which is not statistically different from zero, suggests that, following the disclosure of RPO, advertisers reduced their bids only 0.4 percent more per month than they did before. Thus, even that estimate is inconsistent with the plaintiffs' theory of harm.

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not cause a decline in advertiser bids and CPM.

207. This conclusion is consistent with the analysis in Section II.B regarding how advertisers, their advertiser agencies, and their ad buying tools generally learn, evaluate performance, and determine how to adapt optimally to changes in the auction environment, and how they do so regardless of whether they know the details of optimization features. These the results are inconsistent with plaintiffs' theory that announcements or disclosures about optimization features are a primary driver of advertiser decision-making.
208. For all of these reasons, I conclude that the alleged deception about RPO did not generate additional profit for Google. According to Mr. Andrien's framework, the absence of additional profit implies that the appropriate civil penalty for the alleged RPO-related deception is zero.
209. Despite the evidence indicating that the alleged deception about RPO did not generate additional profit for Google, I also perform a second analysis that provides a conservative estimate of Google's incremental profits from the alleged deception. This analysis assumes (contrary to the evidence discussed above) that the alleged nondisclosure of RPO prevented advertisers from optimally adjusting their bidding behavior. As described in Appendix D, I estimate the degree to which advertisers would have shaded their bids absent the alleged deception about RPO and calculate that, under plaintiffs' theory, Google would have earned an additional \$2,049,015 in profit in the plaintiff States as a result of the alleged deception about RPO. To be clear, I consider that amount to exceed any benefits that Google may have received from such alleged deception because it assumes that announcements relating to optimization features are a primary driver of advertiser behavior. That assumption is inconsistent both with how advertisers generally behave, as discussed in Section II.B, and with the evidence indicating that average CPM in AdX did not decline after the public disclosure of RPO.

B. Dynamic Revenue Sharing

210. Prior to the introduction of sell-side Dynamic Revenue Sharing ("DRS") in August 2015, AdX generally kept as a "revenue share" approximately 20% of gross revenues (i.e., the